



1970

**OPERATING  
SUMMARY**

# **BELLEVILLE**

## **water pollution control plant**

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Belleville : water pollution  
control plant.

81622



*Water management in Ontario*

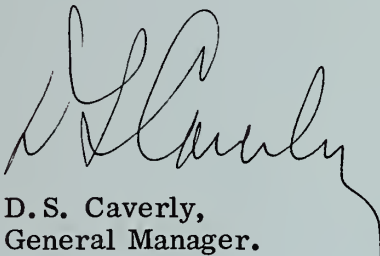
Ontario  
Water Resources  
Commission

135 St. Clair Ave. W.  
Toronto 195  
Ontario

Once again we have the privilege of submitting to you our latest detailed report on financial progress and technical activity at your water pollution control plant.

The statistical information contained in this annual operating summary will undoubtedly be a useful barometer of efficiency. Of particular interest will be the comments and recommendations of the regional operations engineer, who was intimately connected with day-to-day operation throughout 1970.

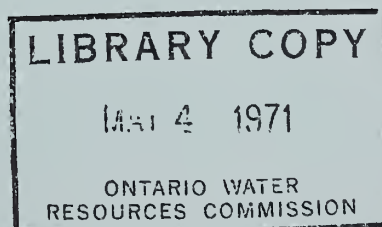
Together with the extensive cost data provided, this information should assist greatly in your general understanding of the problems met and dealt with, and in furnishing a yardstick for possible future expansion.



D. S. Caverly,  
General Manager.



D. A. McTavish, P. Eng.,  
Director,  
Division of Plant Operations.



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**BELLEVILLE**  
**water pollution control plant**

operated for

THE CITY OF BELLEVILLE

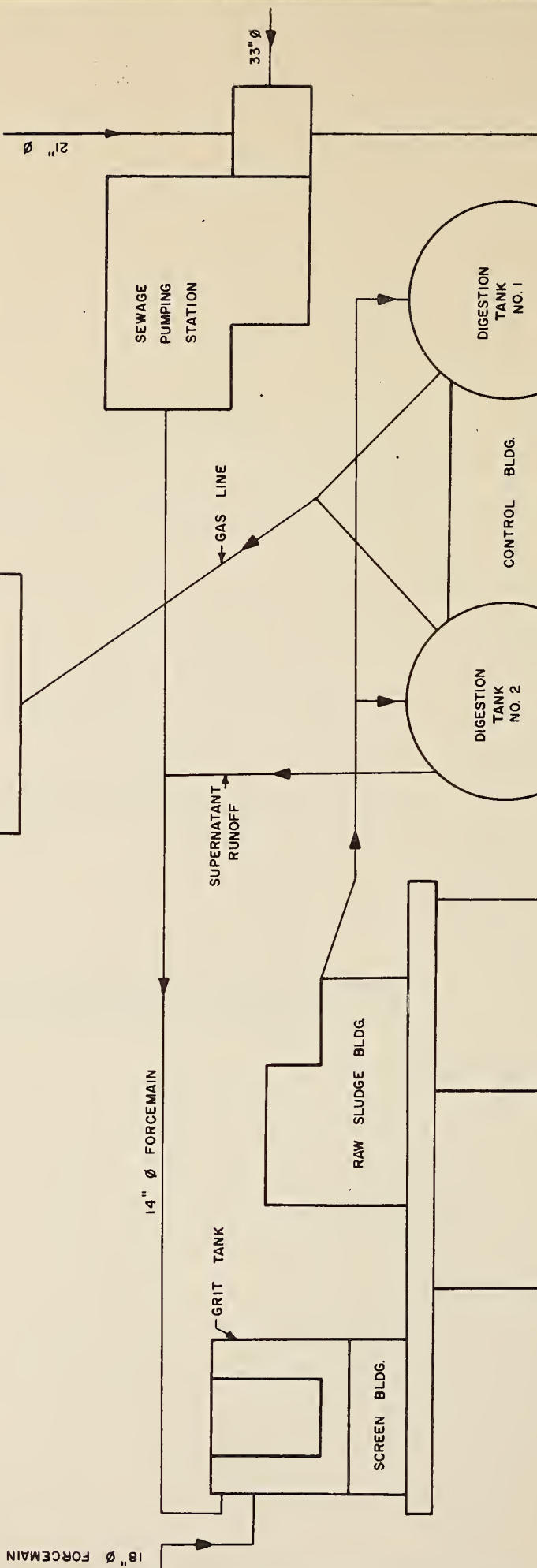
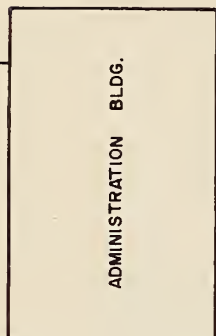
by the

ONTARIO WATER RESOURCES COMMISSION

**1970 ANNUAL OPERATING SUMMARY**

# FLOW DIAGRAM

4" Ø WATER PIPE



SLUDGE LOADING BAY



## DESIGN DATA

|                  |           |                   |          |
|------------------|-----------|-------------------|----------|
| PROJECT NO.      | 1-0004-66 | TREATMENT         | Primary  |
| DESIGN FLOW      | 3.0 mgd   | DESIGN POPULATION | 30,000   |
| BOD - Raw Sewage | 225 mg/l  | SS - Raw Sewage   | 260 mg/l |
| - Removal        | 30%       | Removal           | 65%      |

### PRIMARY TREATMENT

#### Grit Removal

Type: Aerated grit tank with grab bucket  
 Size: One 24' x 14' x 12½' (26,200 gal)  
 Retention: 12.5 min  
 Air Supply: Two Roots blowers, 610 cfm ea

#### Screening

Type: Mechanically cleaned  
 Size: 2" opening

#### Comminution

Type: Chicago pump barminutor  
 Model C

#### Primary Sedimentation

Type: Rex chainbelt  
 Size: Four 70' x 18' x 12' (377,500 gal)  
 Retention: 3.0 hours  
 Loading: Surface, 600 gal/ft<sup>2</sup>/day  
 Weir, 11,000 gal/ft/day

### CHLORINATION

Type: F & P model 70C3410B  
 Size: One 1,000 lb/day

#### Chlorine Contact Chamber

- in outfall

### OUTFALL

- 1179' of 36" dia concrete pipe  
 300' of 33" dia concrete pipe  
 to Bay of Quinte

### SLUDGE HANDLING

#### Digestion System

Type: Two-stage  
 Primary --  
     Type: Gas mixed  
     Size: One 45' dia x 25' swd  
         (40,000 cu ft or 249,000 gal)  
 Loading: 3.82 lb/cu ft/mo  
 Secondary --  
     Type: Fixed cover  
     Size: One 45' dia x 25' swd  
         (40,000 cu ft or 249,000 gal)  
 Total Loading: 1.91 lb/cu ft/mo

#### Gas Booster

Type: Spencer  
 Size: One 150 cfm

### PUMPING STATIONS

#### (a) Plant Site (@ 35' tdh)

One Worthington 2500 gpm (electric)  
 One Worthington 1666 gpm (electric)  
 One Worthington 2500 gpm (diesel)

#### (b) Front Street (@ 55' tdh)

One Worthington 2500 gpm (electric)  
 One Worthington 1666 gpm (electric)  
 One Worthington 3332 gpm (diesel)

#### (c) Dundas Street West (@ 29' tdh)

One Worthington 416 gpm (electric)  
 One Worthington 1300 gpm (diesel)

# **'70 REVIEW**

## GENERAL

The Belleville sewage treatment works consist of a 3.0 MGD primary treatment plant, three pumping stations and associated trunk sewers and force-mains. Until April 3, 1970, these works were all part of the OWRC - Municipal project No. 2-0084-61. After this date a new OWRC - Provincial project (No. 1-0004-66) was initiated, which incorporated most of the existing works and a proposed expansion of the plant. The Dundas Street pumping station and certain trunk sewers remain as part of the old OWRC Municipal project. Expansion of the treatment plant to an 8.0 MGD secondary treatment facility and increasing the capacity of the two main pumping stations began in May of 1970 and continued throughout the year.

Operation of this project during 1970 was difficult due to heavy hydraulic overload and construction of the enlargement.

The forcemain from the Front Street pumping station to the treatment plant was damaged twice. Both breaks necessitated some bypassing of raw sewage during repairs. All bypassing was heavily chlorinated. Flow recording at the treatment plant was interrupted from July to November because the Parshall flume which records the plant flow had to be taken out of service due to construction adjacent to it.

A fire apparently due to the failure of a transformer occurred in the control panel of one of the pumps at the Front Street pumping station. An insurance claim was filed to cover the damage and service was not seriously interrupted.

Equipment was ordered for a new bubbler system for control of the variable speed pumps in the Front Street and plant pumping stations.

An alarm system has been installed in the Front Street and plant pumping stations to detect the occurrence of flooding in the dry well. A similar system was installed to detect flooding upstream of the barminutor and all alarms are monitored at the treatment plant and a local telephone answering service.

Three new operators were hired in 1970. Two of these men have proven satisfactory, however, employment of the remaining individual was terminated due to unsatisfactory work habits. Total plant staff consisted of six men at the end of 1970. The plant staff are to be commended for their work during the past year.

## EXPENDITURE

The cost of operating the sewage works was \$100,037.00 during 1970. This figure includes the costs for both the Provincial and OWRC-Municipal projects. The budget figure of \$90,000 was exceeded due primarily to the purchase of bubbler systems for the pumping stations and to the hiring of additional operators.

| FLOWS   | DAILY FLOW<br>mil gal | OCCURRING IN THE<br>MONTH OF | MONTHLY FLOW<br>mil gal | OCCURRING IN THE<br>MONTH OF |
|---------|-----------------------|------------------------------|-------------------------|------------------------------|
| Average | 5.71                  | —                            | 1381.7                  | —                            |
| High    | 8.61                  | December                     | 267.2                   | December                     |
| Low     | 3.28                  | June                         | 74.9                    | July                         |

## PLANT FLOWS and CHLORINATION

Due to the fact that the plant flow meter was out of service, flow records are not available for the period from July 17, 1970 to November 4, 1970. Records after November 4, have indicated a considerable increase in flows with respect to records prior to July 17. It is believed that the increase is due primarily to additional flows from the east end of the City.

## PLANT EFFICIENCY

The average reduction in BOD and suspended solids of the raw sewage treated at the plant was 69% and 57% respectively. This degree of treatment is satisfactory for a primary plant, particularly an overloaded one. It is believed that the efficiency of the plant is enhanced by a waste containing ferric oxide from one of the local industries.

## SLUDGE DISPOSAL and DIGESTION

A total of 1873 cubic yards of sludge were removed from the digesters in 1970. The sludge was hauled by tank truck to dumping sites and agricultural land. The average volatile solids concentration was 44%, indicating that the material was well digested.

## **CONCLUSIONS**

Operation of the sewage works has been difficult due to the overloading and expansion of the plant. The efficiency of BOD and suspended solids removal however remained satisfactory. The completion of the expanded facilities in 1971 will alleviate many of the current operating difficulties and result in a much improved plant effluent.



2-0084-61

# MONTHLY OPERATING COSTS

| MONTH | TOTAL<br>EXPENDITURE | PAYROLL   | CASUAL<br>PAYROLL | FUEL    | POWER    | CHEMICALS | GENERAL<br>SUPPLIES | EQUIPMENT | REPAIRS and<br>MAINTENANCE | *<br>SUNDRY | WATER  | TRAVEL   |
|-------|----------------------|-----------|-------------------|---------|----------|-----------|---------------------|-----------|----------------------------|-------------|--------|----------|
| JAN   | 4994.11              | 3365.00   | -                 | 132.80  | 402.89   | -         | 193.42              | -         | 179.43                     | 357.10      | -      | 363.47   |
| FEB   | 4441.03              | 2462.95   | -                 | 317.97  | 744.40   | -         | 85.66               | -         | 208.14                     | 109.59      | -      | 512.32   |
| MAR   | 6170.00              | 2704.29   | -                 | 408.45  | 818.12   | 1051.05   | 491.40              | -         | 129.78                     | 88.71       | 85.00  | 393.20   |
| APR   | 5437.64              | 2863.19   | -                 | 425.15  | 810.33   | -         | 214.02              | 160.31    | 220.96                     | 351.79      | -      | 391.89   |
| MAY   | 5178.24              | 3218.89   | -                 | -       | 895.42   | -         | 99.88               | 156.98    | 218.19                     | 157.34      | -      | 431.54   |
| JUNE  | 21056.85             | 3127.73   | -                 | 147.71  | 790.98   | -         | 156.50              | -         | 68.00                      | 16390.28    | 6.00   | 369.65   |
| JULY  | 336.04               | -         | -                 | 116.20  | 30.28    | -         | 183.38              | -         | -                          | -           | -      | 6.18     |
| AUG   | 51.11                | -         | -                 | -       | 24.59    | -         | 13.23               | -         | -                          | -           | -      | 13.29    |
| SEPT  | 1215.46              | -         | -                 | -       | 36.53    | -         | -                   | -         | -                          | 1161.26     | -      | 17.67    |
| OCT   | (14820.65)           | -         | (2840.68)         | (60.40) | (695.64) | -         | (21.68)             | -         | (68.00)                    | (10779.62)  | (6.00) | (348.54) |
| NOV   | 1480.11              | 85.80     | -                 | -       | 29.71    | 1352.40   | -                   | -         | -                          | -           | -      | 12.20    |
| DEC   | (4940.63)            | (3049.93) | -                 | (1.81)  | 52.33    | -         | (13.23)             | -         | 9.67                       | (1939.30)   | -      | 1.64     |
| TOTAL | 30599.31             | 14777.92  | (2840.68)         | 1485.97 | 3939.95  | 2403.45   | 1402.58             | 317.29    | 966.17                     | 5897.15     | 85.00  | 2164.51  |

BRACKETS INDICATE CREDIT

\* SUNDRY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE \$1537.20

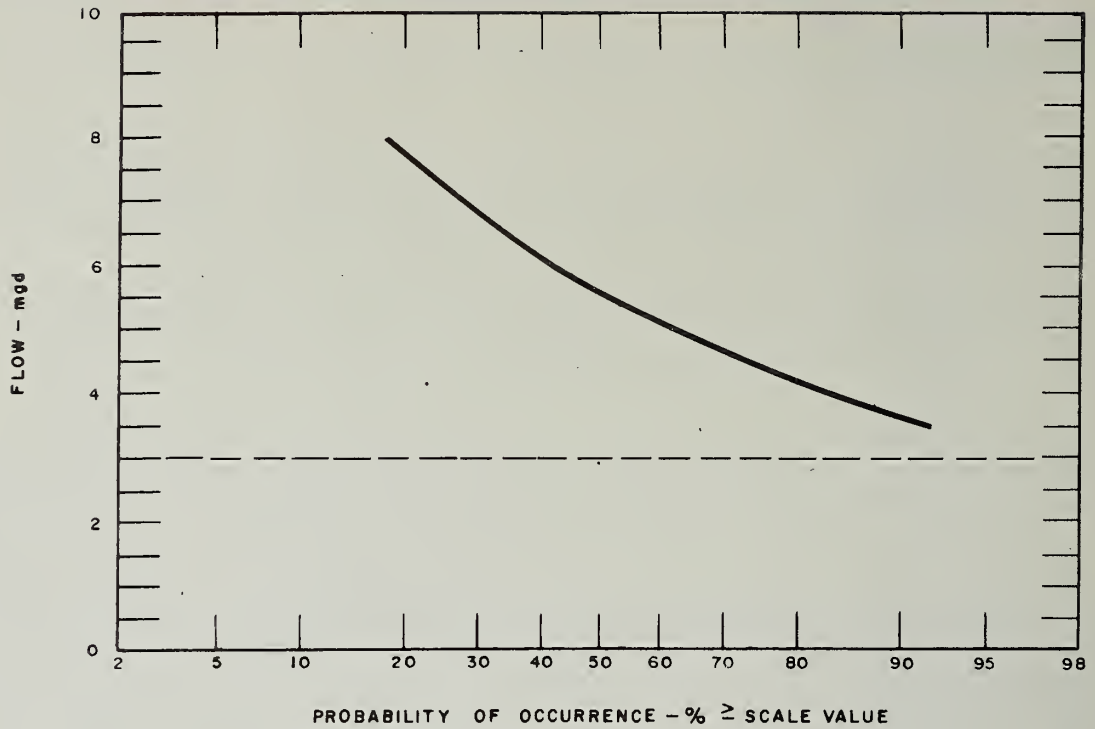
1-0004-66

# MONTHLY OPERATING COSTS

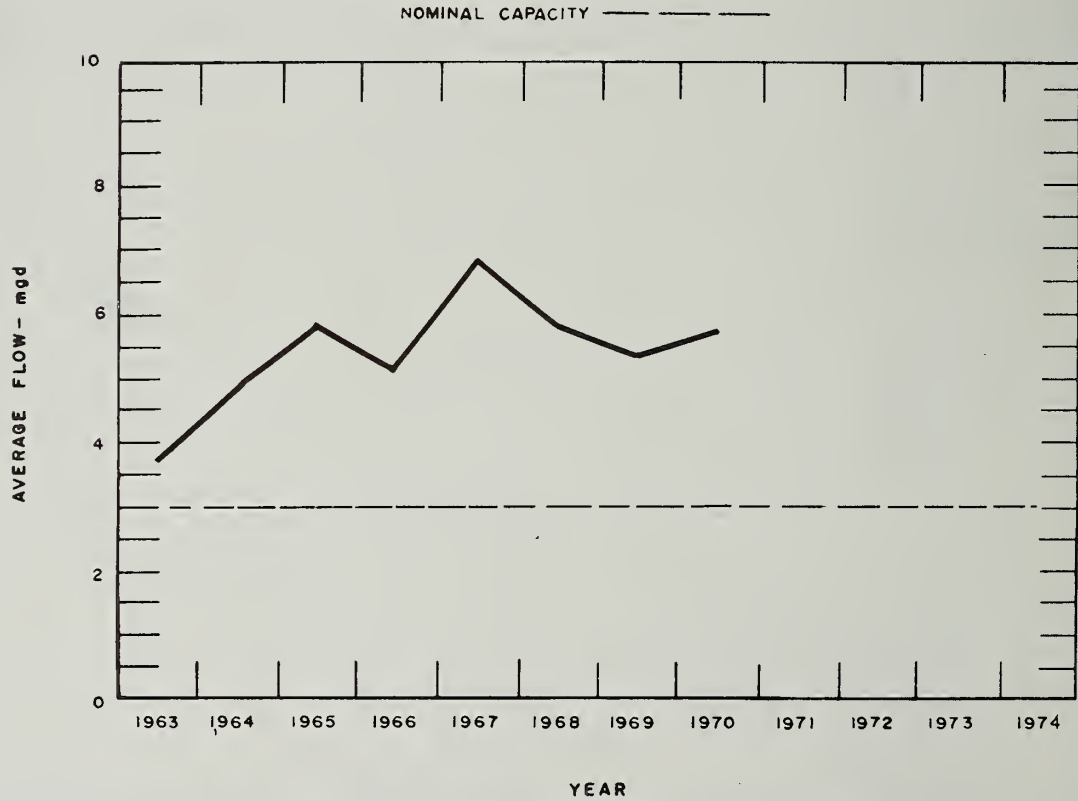
| MONTH | TOTAL<br>EXPENDITURE | PAYROLL  | CASUAL<br>PAYROLL | FUEL   | POWER   | CHEMICALS | GENERAL<br>SUPPLIES | EQUIPMENT | REPAIRS and<br>MAINTENANCE | SUNDRY   | WATER  | TRAVEL  |
|-------|----------------------|----------|-------------------|--------|---------|-----------|---------------------|-----------|----------------------------|----------|--------|---------|
| JAN   |                      |          |                   |        |         |           |                     |           |                            |          |        |         |
| FEB   |                      |          |                   |        |         |           |                     |           |                            |          |        |         |
| MAR   |                      |          |                   |        |         |           |                     |           |                            |          |        |         |
| APR   |                      |          |                   |        |         |           |                     |           |                            |          |        |         |
| MAY   |                      |          |                   |        |         |           |                     |           |                            |          |        |         |
| JUNE  | 197.14               | 55.00    | -                 | -      | -       | -         | -                   | 3.75      | -                          | 138.39   | -      | -       |
| JULY  | 7785.57              | 2847.28  | 329.32            | 136.44 | 1091.59 | 1352.40   | 553.57              | 560.03    | 552.82                     | 198.94   | 90.75  | 72.43   |
| AUG   | 7524.59              | 4387.07  | 493.98            | -      | 759.08  | -         | 146.29              | 15.49     | 756.44                     | 297.19   | -      | 669.05  |
| SEPT  | 7242.97              | 2877.86  | 329.32            | -      | 494.29  | 1352.40   | 343.70              | 89.72     | 880.13                     | 331.30   | -      | 544.25  |
| OCT   | 22615.23             | 3658.38  | 3087.36           | 60.50  | 1377.86 | 132.30    | 251.62              | 1014.27   | 812.42                     | 11341.64 | 6.00   | 872.88  |
| NOV   | 6286.19              | 3619.87  | 411.06            | 95.08  | 643.50  | -         | 342.69              | -         | 305.18                     | 361.13   | -      | 507.68  |
| DEC   | 17786.77             | 6484.37  | 329.32            | 208.31 | 1689.78 | -         | 391.24              | 4410.00   | 1976.30                    | 1084.29  | 150.17 | 1062.99 |
| TOTAL | 69438.46             | 23929.83 | 4980.36           | 500.33 | 6056.10 | 2837.10   | 2029.11             | 6093.26   | 5283.29                    | 13752.88 | 246.92 | 3729.28 |

BRACKETS INDICATE CREDIT

## PROCESS DATA



## FLAWS



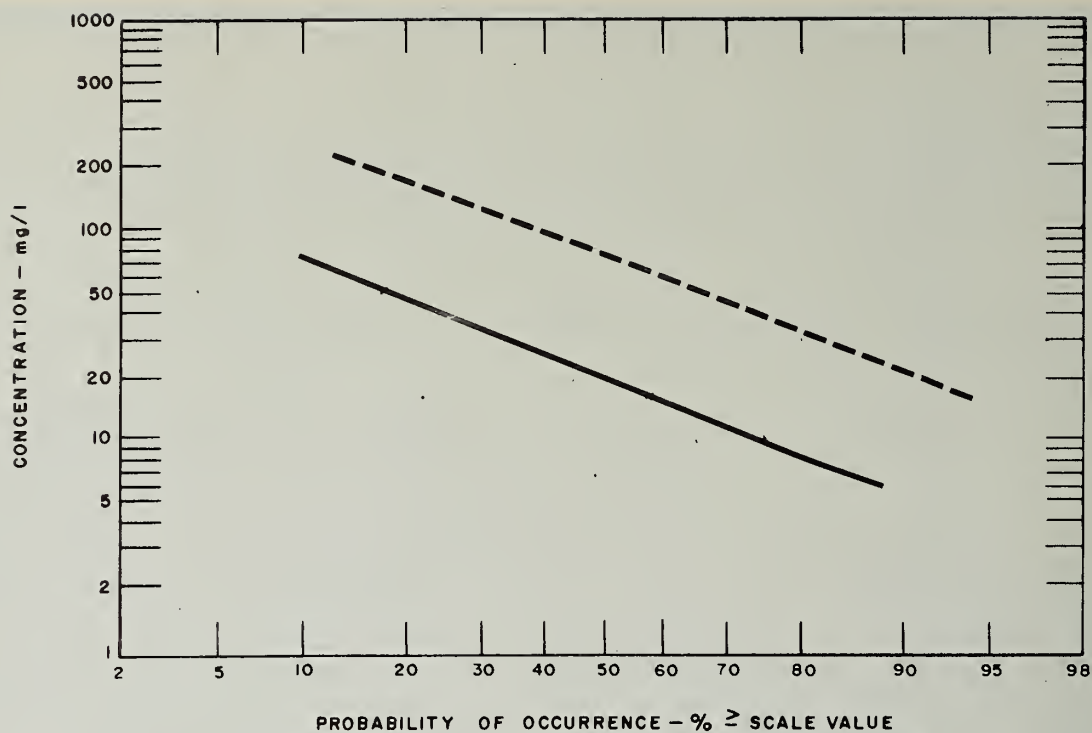
## PLANT FLOWS and CHLORINATION

| MONTH   | TOTAL FLOW<br>mil gal | AVERAGE<br>DAILY FLOW<br>mil gal | MAXIMUM<br>DAILY FLOW<br>mil gal | MINIMUM<br>DAILY FLOW<br>mil gal | CHLORINE USED<br>10 <sup>3</sup> pounds | DOSAGE<br>mg/l |
|---------|-----------------------|----------------------------------|----------------------------------|----------------------------------|-----------------------------------------|----------------|
| JAN     | 152.1                 | 4.92                             | 6.3                              | 4.3                              | 6.0                                     | 3.9            |
| FEB     | 172.6                 | 6.16                             | 8.3                              | 5.0                              | 5.2                                     | 3.0            |
| MAR     | 152.9 a               | 7.63                             | 9.5                              | 5.2                              | 6.0                                     | 3.9            |
| APR     | 154.4                 | 5.1                              | 9.7                              | 2.3                              | 5.8                                     | 3.7            |
| MAY     | 121.1                 | 3.91                             | 6.1                              | 3.1                              | 3.8                                     | 4.9            |
| JUNE    | 98.3                  | 3.28                             | 4.8                              | 2.1                              | 6.0                                     | 6.1            |
| JULY    | 74.9 b                | 3.94                             | 4.3                              | 2.9                              | 7.4                                     | 9.9            |
| AUG     | -                     | -                                | -                                | -                                | 5.9                                     | -              |
| SEPT    | -                     | -                                | -                                | -                                | 6.0                                     | -              |
| OCT     | -                     | -                                | -                                | -                                | 6.2                                     | -              |
| NOV     | 188.2 c               | 8.57                             | 12.2                             | 5.0                              | 6.0                                     | 3.2            |
| DEC     | 267.2                 | 8.61                             | 12.8                             | 6.2                              | 6.0                                     | 2.2            |
| TOTAL   | -                     | -                                | -                                | -                                | 70.3                                    | -              |
| AVERAGE | -                     | 5.71                             | 12.8                             | 2.1                              | -                                       | 3.3            |

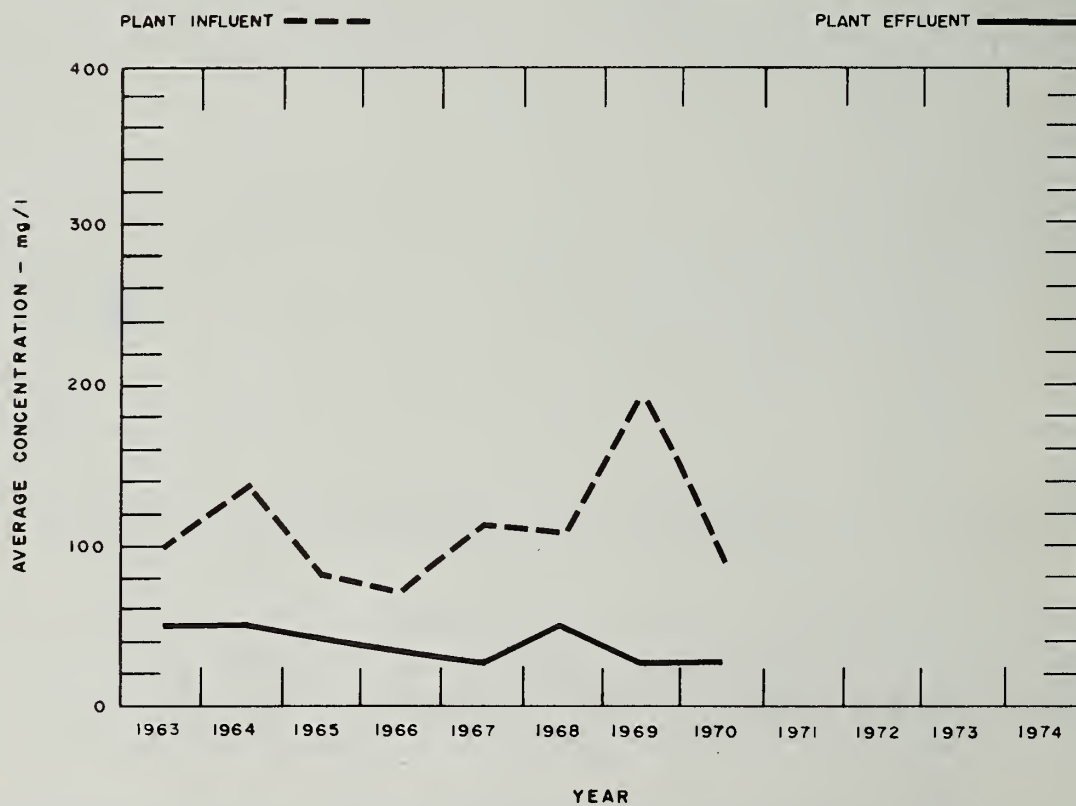
a - 20 days

b - 19 days

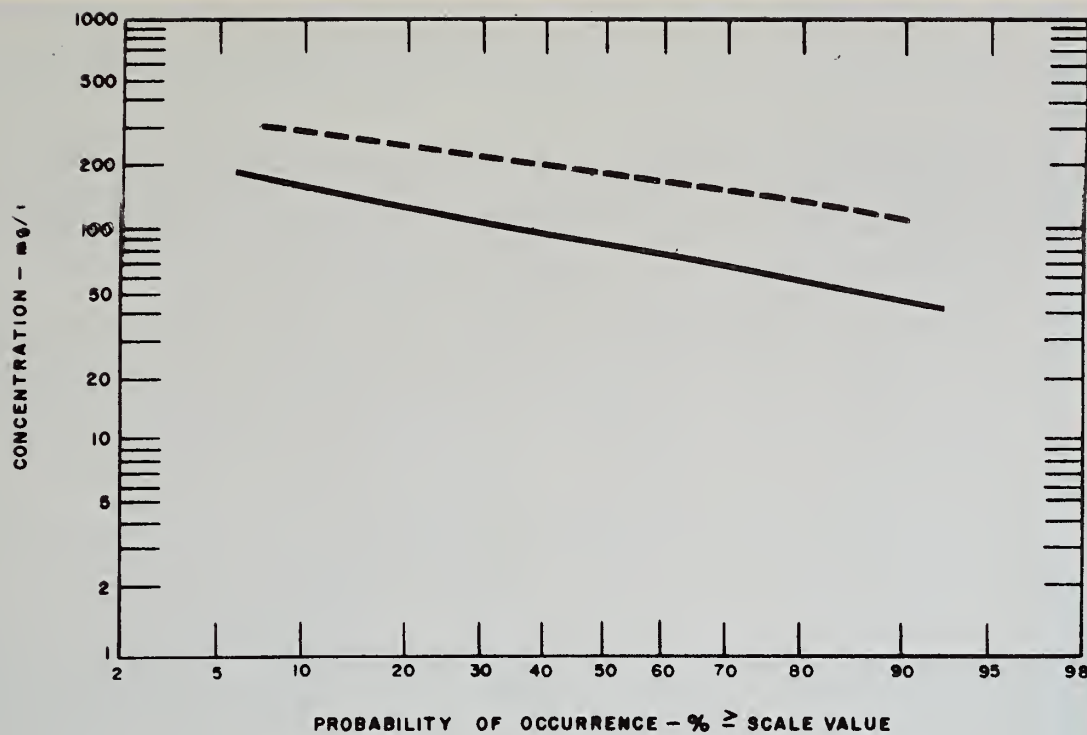
c - 22 days



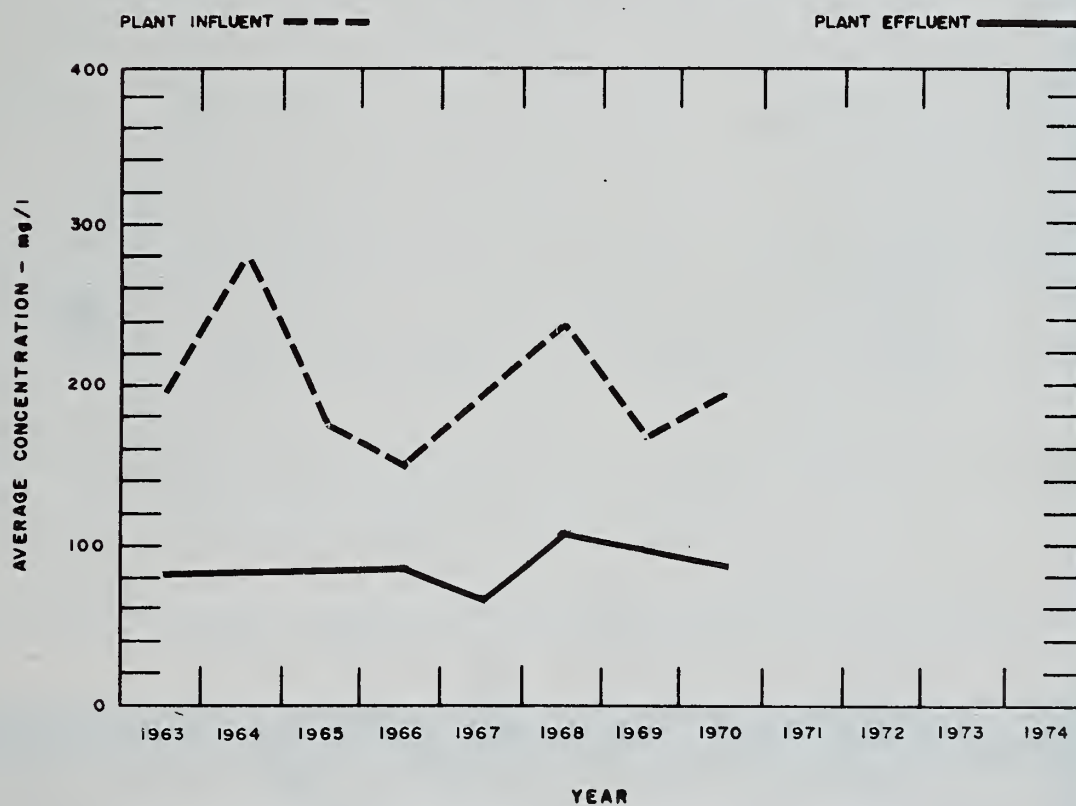
## BIOCHEMICAL OXYGEN DEMAND







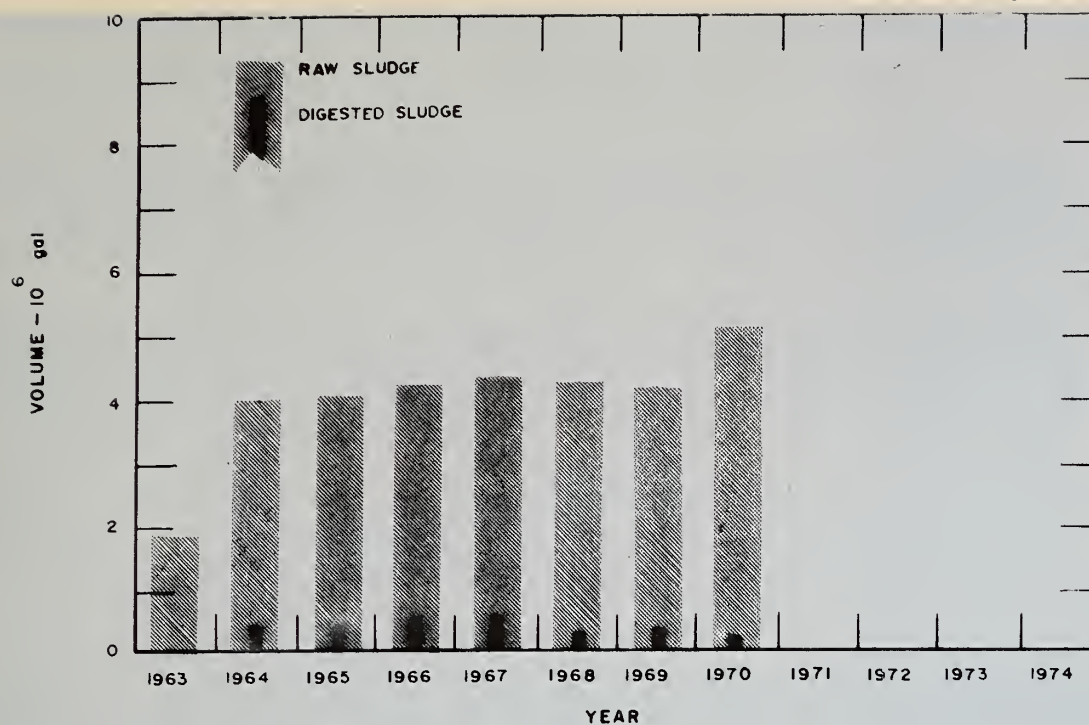
## SUSPENDED SOLIDS



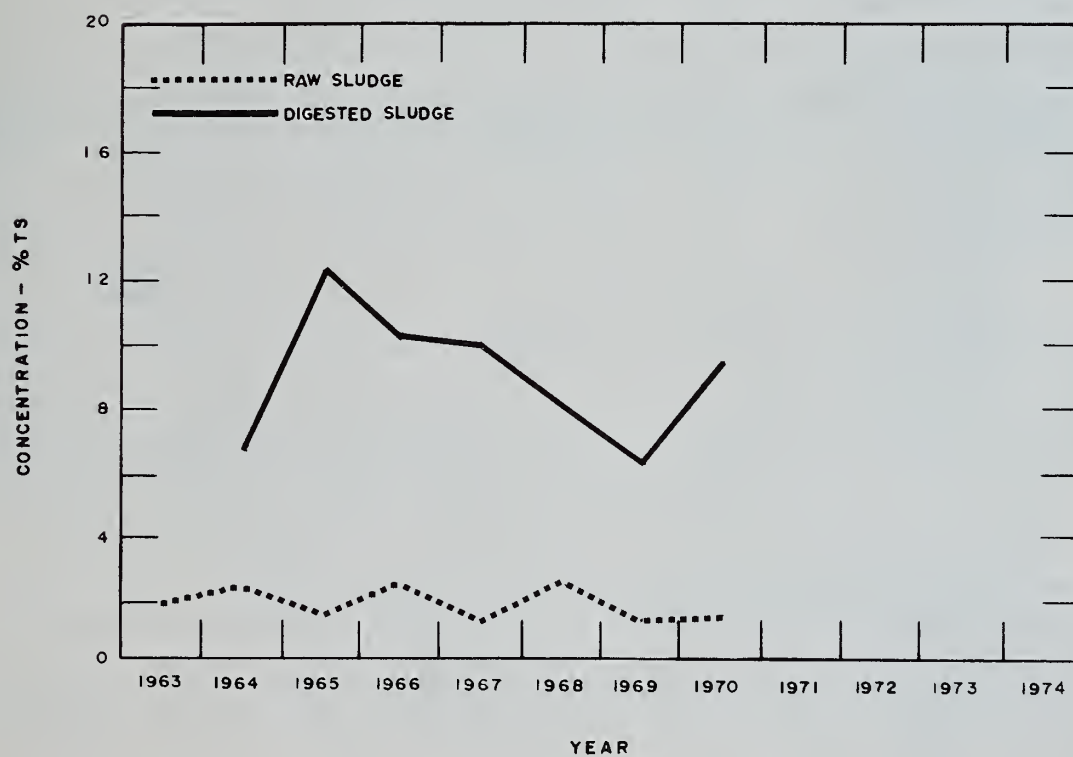
## PLANT EFFICIENCY

| MONTH   | BIOCHEMICAL OXYGEN DEMAND |      |          |      |           |                           | SUSPENDED SOLIDS |      |          |      |           |                           | GRIT<br>REMOVED<br><br>cu ft |
|---------|---------------------------|------|----------|------|-----------|---------------------------|------------------|------|----------|------|-----------|---------------------------|------------------------------|
|         | INFLUENT                  |      | EFFLUENT |      | REDUCTION |                           | INFLUENT         |      | EFFLUENT |      | REDUCTION |                           |                              |
|         | n                         | mg/l | n        | mg/l | %         | 10 <sup>3</sup><br>pounds | n                | mg/l | n        | mg/l | %         | 10 <sup>3</sup><br>pounds |                              |
| JAN     | 1                         | 80   | 1        | 19   | 76        | 90                        | 5                | 160  | 5        | 97   | 39        | 100                       | -                            |
| FEB     | 1                         | 100  | 1        | 50   | 50        | 90                        | 5                | 185  | 5        | 96   | 48        | 150                       | -                            |
| MAR     | 1                         | 60   | 1        | 21   | 65        | 60                        | 6                | 144  | 6        | 81   | 75        | 90                        | -                            |
| APR     | 2                         | 62   | 2        | 14   | 77        | 70                        | 5                | 157  | 5        | 63   | 60        | 140                       | -                            |
| MAY     | -                         | -    | -        | -    | -         | -                         | 4                | 165  | 4        | 105  | -         | -                         | -                            |
| JUNE    | 2                         | 28   | 2        | 16   | 43        | 10                        | 6                | 158  | 6        | 69   | 56        | 90                        | -                            |
| JULY    | 3                         | 67   | 2        | 8    | 88        | 40                        | 4                | 205  | 4        | 39   | 81        | 120                       | -                            |
| AUG     | 2                         | 200  | 1        | 4    | 98        | -                         | 4                | 362  | 5        | 80   | 78        | -                         | -                            |
| SEPT    | 1                         | 180  | 1        | 36   | 80        | -                         | 6                | 267  | 6        | 95   | 64        | -                         | -                            |
| OCT     | 1                         | 100  | 5        | 42   | 58        | -                         | 5                | 226  | 5        | 108  | 52        | -                         | -                            |
| NOV     | 1                         | 20   | 1        | 9    | 55        | 20                        | 5                | 148  | 5        | 112  | 24        | 680                       | -                            |
| DEC     | -                         | -    | -        | -    | -         | -                         | 5                | 199  | 5        | 87   | 56        | 299                       | -                            |
| TOTAL   | 15                        | -    | 17       | -    | -         | 380                       | 60               | -    | 61       | -    | -         | 1669                      | -                            |
| AVERAGE | -                         | 88   | -        | 25   | 69        | -                         | -                | 195  | -        | 86   | 57        | -                         | -                            |

NOTE - n is the number of samples taken



## DIGESTION



## SLUDGE DIGESTION and DISPOSAL

| MONTH   | RAW SLUDGE          |              |            | DIGESTED SLUDGE     |              |            | SUPERNATANT         |              | SLUDGE DISPOSAL |        |
|---------|---------------------|--------------|------------|---------------------|--------------|------------|---------------------|--------------|-----------------|--------|
|         | VOLUME              | TOTAL SOLIDS | VOL SOLIDS | VOLUME              | TOTAL SOLIDS | VOL SOLIDS | VOLUME              | TOTAL SOLIDS | DEWATERED       | LIQUID |
|         | 10 <sup>3</sup> gal | %            | %          | 10 <sup>3</sup> gal | %            | %          | 10 <sup>3</sup> gal | %            | cu yd           | cu yd  |
| JAN     | 380                 | 2.0          | 54         | -                   | 7.3          | 46         | 370                 | .01          | -               | 0      |
| FEB     | 350                 | 1.6          | 58         | 54                  | 6.7          | 46         | 250                 | .05          | -               | 323    |
| MAR     | 380                 | 1.4          | 49         | 21                  | 9.6          | -          | 360                 | .02          | -               | 126    |
| APR     | 370                 | 1.6          | 52         | -                   | 9.8          | 42         | 310                 | .01          | -               | -      |
| MAY     | 380                 | 1.4          | 44         | -                   | -            | -          | 330                 | .02          | -               | -      |
| JUNE    | 370                 | 1.8          | 46         | 22                  | 15.3         | 41         | 310                 | .04          | -               | 131    |
| JULY    | 390                 | 1.6          | 44         | 112                 | -            | -          | 370                 | .07          | -               | 664    |
| AUG     | 400                 | 1.9          | 52         | -                   | -            | -          | 390                 | -            | -               |        |
| SEPT    | 380                 | 2.6          | 53         | 56                  | -            | -          | 366                 | .22          | -               | 332    |
| OCT     | 398                 | 2.1          | 54         | -                   | -            | -          | 381                 | .56          | -               |        |
| NOV     | 631                 | 1.7          | 59         | 50                  | -            | -          | 460                 | 1.9          | -               | 297    |
| DEC     | 656                 | 1.6          | 60         | -                   | -            | -          | 494                 | .09          | -               |        |
| TOTAL   | 5085                | -            | -          | 315                 | -            | -          | 4391                | -            | -               | 1873   |
| AVERAGE | -                   | 1.8          | 52         | 52                  | 9.7          | 44         | -                   | .12          | -               | 312    |

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